

1.4303

X4CrNi18-12

Chromium-nickel austenitic stainless steel with low carbon content

C max. 0.06 Cr 17.00 – 19.00 Ni 11.00 – 13.00

General comments

1.4303 is essentially a more highly alloyed version of 1.4306, i.e. the nickel content is slightly higher, and as such it is more resistant to corrosion. The higher nickel content of this steel results in a more stable austenite phase which makes the steel particularly suited to cold forming.

	C max.	Cr	Ni	Cold forming
1.4301	0.07	17.0 – 19.5	8.0 – 10.5	good
1.4306	0.03	18.0 – 20.0	10.0 – 12.0	better
1.4303	0.06	17.0 – 19.0	11.0 – 13.0	best

1.4303 finds itself in a diminishing market as far as profiles is concerned since the same, if not superior, cold forming properties can be attained at a lower cost by utilising 1.4567.

Relevant current and obsolete standards

EN 10088-3	1.4303	X4CrNi18-12
AISI	305 / 308	
BS	305S17 / 305S19	
JIS	SUS305 / SUS305J1	
AFNOR	Z5CN18-11FF	
DIN 17440	1.4303	

Special grades for particular applications

cold heading grade	DIN EN 10263-5
drawing grades	
fine wire grade	
ultra-fine wire drawing grade	

General properties

corrosion resistance	good
mechanical properties	average
forgeability	very good
weldability	excellent
machinability	poor

Special properties

resistant to scaling up to around 600 °C
suited for cryogenic applications
non-magnetic grade ($\mu_r \leq 1,3$)
can be readily cold formed

Physical properties

density (kg/dm ³)	7.90
electrical resistivity at 20 °C (Ω mm ² /m)	0.73
magnetizability	no
thermal conductivity at 20 °C (W/m K)	15
specific heat capacity at 20 °C (J/kg K)	500
thermal expansion (K ⁻¹)	20 – 100 °C: 16.0 x 10 ⁻⁶ 20 – 200 °C: 16.5 x 10 ⁻⁶ 20 – 300 °C: 17.0 x 10 ⁻⁶ 20 – 400 °C: 17.5 x 10 ⁻⁶ 20 – 500 °C: 18.0 x 10 ⁻⁶

Typical applications

automotive industry
chemical industry
food and beverage industry
mechanical engineering
decorative items and kitchen utensils
electronic equipment
production of screws
petrochemical industry

Note: diameters $\geq \varnothing$ 23 mm on request

Processing properties

automated machining	seldom
machinable	yes
hammer and die forging	yes
cold forming	yes
cold heading	yes
suited to polishing	yes

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Conditions solution annealed and quenched, mainly products made from wire

Demand tendency decreasing

Corrosion resistance (PRE = 18.0 – 20.76)

Although, according to norm, this grade of steel is susceptible to intergranular corrosion in the as-welded condition, the lower carbon content attained in practice results in 1.4303 displaying virtually no tendency for the formation of chromium carbides and the associated chromium depleted regions that would form around these precipitates.

1.4303 is resistant to corrosion in most natural waters and urban and rural atmospheres, provided that the chloride and salt contents are low. This grade of stainless steel is not resistant to sea water and as such must not be used in any sea water applications. As with 1.4306, this steel is not suited for use in swimming pools or swimming pool environments. Resistance to reducing acids is also confined to low concentrations and low temperatures.

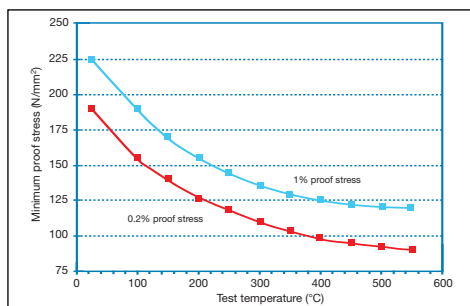
Heat treatment and mechanical properties

Optimal material properties are realised after solution annealing in the temperature range 1000 °C – 1100 °C followed by rapid cooling in air or water. During operation and fabrication, the time spent in the temperature range 450 °C – 850 °C must be minimised to avoid embrittlement. In the solution annealed condition, the following mechanical properties may be attained:

Property	Specification	Typical
yield strength (N/mm ²)	R _{p0.2} ≥ 190	350
tensile strength (N/mm ²)	R _m 500 – 700	645
tensile elongation (%)	A ₅ ≥ 45	50
hardness	HB ≤ 215	195
impact energy (J) 25 °C	ISO-V ≥ 100	225

1.4301 is weldable with or without the use of filler material. If the use of a filler metal is required, then the use of Novonit 4316 (AISI 308L) would be recommended. Maximum interpass temperature 200 °C. Post weld heat treatment is not necessary.

Elevated temperature properties



Minimum tensile properties at various temperatures, shown in the diagram, are specified in the EN 10088-3.

Welding

1.4303 is weldable with or without the use of filler material, but is more readily welded when using a filler material. The use of Novonit® 4316 (AISI 308L) is recommended as the preferred filler metal. An interpass temperature of 150 °C should not be exceeded and no post weld heat treatment is necessary. Any scale or heat tint that results from welding or high temperature processing must either be mechanically or chemically removed followed by a suitable passivating treatment to restore the corrosion resistance.

Forging

1.4303 is usually slowly heated to within the temperature range 1150 °C – 1200 °C to allow forging which takes place at temperatures between 1200 °C and 900 °C. Forging is followed by air cooling, or water quenching when no danger of distortion exists.

Machining

As a result of the more stable austenite structure of 1.4303, it displays a lower tendency to work harden when machined. When machining 1.4303, the following cutting parameters can be used as a guideline when using coated hard metal cutting tools. 1.4303 finds itself in a diminishing market as far as profiles is concerned since the same, if not superior, cold forming properties can be attained at a lower cost by utilising 1.4567.

Turning CNC

	Depth of cut (mm)	6	3	1
	Feed rate (mm/r)	0.5	0.4	0.2
Annealed R _m 550 – 650 N/mm ²	Cutting speed (m/min)	140	210	260